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PATENT ABSTRACTS OF JAPAN

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(21)Application number : 03-316482

(71)Applicant : CANON INC

(22)Date of filing : 29.11.1991

(72)Inventor : KISHI HIROYOSHI

(54) MAGNETO-OPTICAL RECORDING MEDIUM

(57)Abstract:

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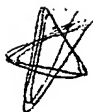
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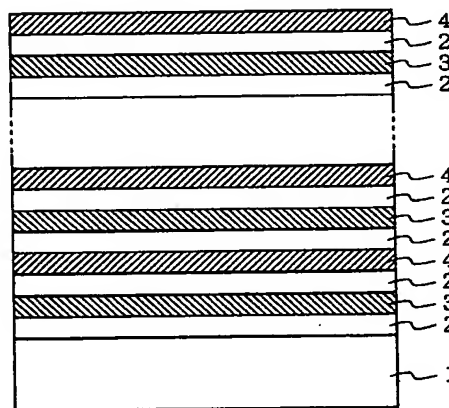
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(54)【発明の名称】光磁気記録媒体

(57)【要約】

【目的】 短波長域で高いカー回転角を持つと共に信頼性の高い光磁気記録媒体の提供。

【構成】 遷移金属元素からなる層の上層及び下層を、白金族元素からなる層で積層した3層構成を第1の層とし、Coを主体とする層を第2の層とし、前記第1の層と第2の層とを交互に複数積層した交互積層膜を記録膜とした光磁気記録媒体。



③

光磁気

A Co Co 主体層 20nm } 交互積層
 C PtPd Pt 白金層 }
 B Au/Ag/Cu Au 遷移金属層 }
 C PtPd Pt 白金層 }

$(Pt/Ag/Pt/Co)$, $(Pt/Au/Pt/Co)$, $(Pt/Cu/Pt/Co)$
 $(Pd/Ag/Pd/Co)$, $(Pd/Au/Pd/Co)$, $(Pd/Cu/Pd/Co)$

【従来の技術】一般に、膜面に対し垂直な方向に磁化容易軸を有する垂直磁化膜は、レーザー光などの光ビームを照射することで、数 μm 以下のスポットで情報を記録

【０００８】すなわち第１発明は、磁性層と貴金属層とが交互に積層された状態を

効果等により、所望の θ_K の増大が見られた。

【0013】上記効果を十分に得るためには、第1の層として、白金元素を少なくとも1原子層ずつと、遷移金属元素を少なくとも1原子層は必要であるため、第1の層の基本単位の膜厚は8Å以上、更に、垂直磁化膜であるためには30Å以下、Coを主体とする第2の層の基本単位の膜厚は2Å以上10Å以下の必要がある。また、第1の層と、第2の層との交互積層膜の全膜厚は、光学的な反射率や、作製上の考慮から50Å以上500Å以下が望ましい。更に、光磁気記録媒体として、基板はガラス、プラスチック樹脂など使用する光源の波長に対して透明であるものであり、グループ等形成してあっても良い。

【0014】また、本発明の記録膜と基板との間には、下地層を設けても良い。下地層は、記録膜の結晶性を制御したり、膜ひずみを誘起、あるいは調節し、Hcを制御する効果、あるいは／そして、磁気光学効果をエンハンスする効果を持ち、各種金属元素やその合金、また各種誘電体からなる層である更に、記録を積層した後、各種誘電体からなる磁気光学エンハンス層、そして／ある

【0015】

【実施例】

【実施例1】三元の高周波スパッタリング装置において、125mmφのPt, Au, Coのターゲットを設置し、スパッタ圧 6×10^{-3} Torr、成膜速度は、スパッタ電力を100~500Wと変化させることにより

【0016】まず、ガラス基板上に、Ptを5Å相当、次にAu5Å相当、更にPt5Å相当積層し、次にCoを5Å相当成膜した。この順番(Pt/Au/Pt/Co)で8回繰り返して、総膜厚約160Åの積層膜を作成した。

【0017】次に比較例1として、ガラス基板上にPt15Å相当、Co5Å相当の交互積層膜(Pt/Co)を8回繰り返して、総膜厚約160Åの積層膜を作成した。同様に比較例2としてAu15Å相当、Co5Å相当の交互積層膜(Au/Co)を約160Å作成した。

【0018】以上の各積層膜の θ_K の波長依存性及びHc(保磁力)を測定した。この結果、(Pt/Au/Pt/Co)積層膜と(Pt/Co)積層膜は垂直磁化膜となり、そのHcは600Oe(Au/Co)積層膜は

面内膜であった。(Pt/Au/Pt/Co), (Pt/Co)各積層膜の θ_K の波長依存性は図2に示す様に、(Pt/Au/Pt/Co)積層膜では、波長500~550nm付近において、 θ_K の増大が見られた。

【0019】【実施例2, 3】実施例1と同様にして、Auターゲットの代りに、Ag, Cuの各ターゲットを用いて、1層当り5Å相当ずつ、総膜厚約160Åの(Pt/Ag/Pt/Co)積層膜、及び(Pt/Cu/Pt/Co)積層膜を作成した。Hcはそれぞれ550Oe, 600Oeであり、 θ_K の波長依存性は図2に示す様に、(Pt/Ag/Pt/Co)積層膜では400~500nm付近、(Pt/Cu/Pt/Co)積層膜では600nm付近で、比較例1の(Pt/Co)積層膜より増大した。

【0020】【実施例4~6】実施例1~3と同様にして、Ptターゲットの代りに、Pdターゲットを用いて1層当り5Å相当ずつ、総膜厚約160~180Åの(Pd/Au/Pd/Co)積層膜、(Pd/Ag/Pd/Co)積層膜、(Pd/Cu/Pd/Co)積層膜を作成した。次に比較例3としてPd15Å相当、Co5Å相当の(Pd/Co)積層膜を総膜厚約170Å成膜した。Hcは、(Pd/Au/Pd/Co), (Pd/Ag/Pd/Co), (Pd/Cu/Pd/Co), (Pd/Co)各積層膜ともほとんど変わらず650~700Oeであったが、 θ_K の波長依存性の測定の結果は、実施例1~3、及び図2と同様に、Au, Ag, Cu各層を含む積層膜は(Pd/Co)積層膜に比べて、各ピーク波長において20~30%の増大が見られた。

【0021】【実施例7~10】実施例1と同様にして、Co5Å相当に対して、(Pt/Au/Pt)の積層膜厚を種々変えて作成した(Pt/Au/Pt/Co)積層膜のHcを測定した。結果を表1に示す。なお、Pt:Au:Ptの各層の膜厚は、ほぼ1:1:1になる様に設定した。

【0022】次に、Pt/Au/Ptの各層を5Å相当ずつに設定してCo厚を種々変えて作成した(Pt/Au/Pt/Co)積層膜のHcも表1に示す。この結果、(Pt/Au/Pt)の膜厚は8Å以上30Å以下、そして、Co層の膜厚は2Å以上10Å以下の時、垂直磁化膜となった。

【0023】これは、Ptの代りにPd、またAuの代りにAg, Cuにしても、Hcの値は違うが、垂直磁化膜となる膜厚の範囲は同じであった。

【0024】

【表1】

表 1

	(Pt/Au/Pt) 厚	Co厚	総膜厚	Hc
実施例 7	~ 8 Å	~ 5 Å	~170 Å	500 ^{Oe}
" 8	~25	~ 5	~150	300
比較例 4	~32	~ 5	~150	(面内膜)
実施例 9	~15	~ 2	~170	250
" 10	~15	~10	~150	100

【0025】

【発明の効果】以上説明したように、遷移金属元素からなる層の上層及び下層を、白金元素からなる層で積層した3層膜を第1の層とし、Coを主体とする層を第2の層とし、第1の層と第2の層との交互積層膜にすることにより、Coと白金元素との垂直磁気異方性を誘起する界面効果を損うことなく、かつ、遷移金属元素層を設けたことによる効果により、 θ_k が向上した光磁気記録媒体が提供できる。

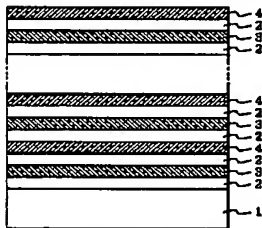
【0026】そして、本発明の光磁気記録媒体は、その特性を充分引き出すために、上記第1の層は、8 Å以上30 Å以下、第2の層は、2 Å以上10 Å以下であるほうが良い。

【図面の簡単な説明】

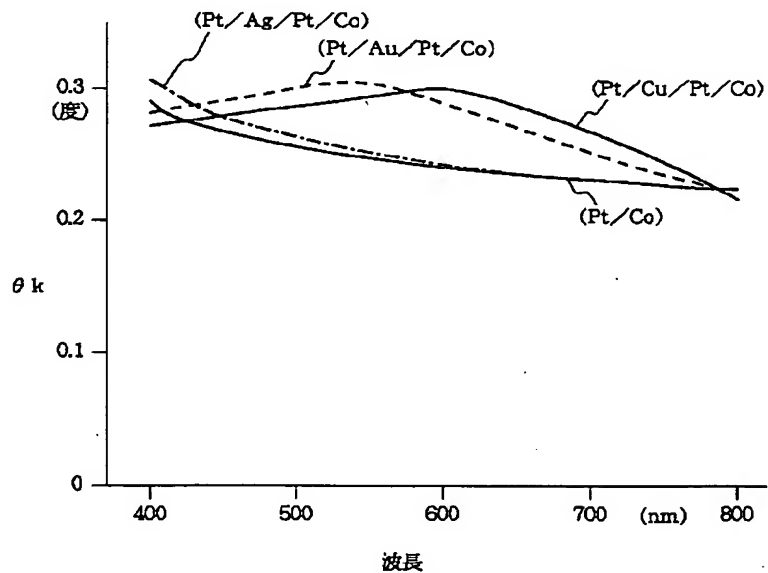
【図1】本発明の光磁気記録媒体の構成例。

【図2】本発明の光磁気記録媒体の θ_k の波長依存性を示す図。

【図1】



【図2】



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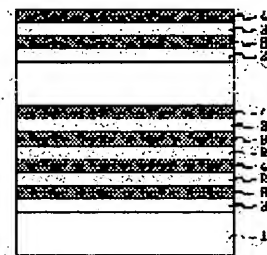
(72)Inventor : KISHI HIROYOSHI

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CLAIMS

[Claim(s)]

[Claim 1] The magneto-optic-recording medium characterized by using as record film the crosswise lamination film which used as the 2nd layer the layer which uses as the 1st layer three layer membranes which carried out the laminating of the upper layer and the lower layer of a layer which consist of a transition-metals element in the layer which consists of platinum group elements, and makes Co a subject, and carried out two or more laminatings of the 1st layer and 2nd layer by turns.

[Claim 2] For 8A or more thickness of the base unit of 30A or less and the 2nd layer, the thickness of the base unit of said 1st layer is a magneto-optic-recording medium according to claim 1 characterized by being 2A or more crosswise lamination film 10A or less.

[Claim 3] Said transition-metals element is a magneto-optic-recording medium given in claims 1 and 2 characterized by being at least one sort of elements chosen from from among Au, Ag, and Cu.

[Claim 4] Said platinum group elements are magneto-optic-recording media given in claims 1 and 2 characterized by being Pt and/, or Pd.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the magneto-optic-recording medium which made the property of the crosswise lamination film of platinum group elements and Co system element improve especially by light, such as laser, about the rewritable magneto-optic-recording medium which records information and is reproduced.

[0002]

[Description of the Prior Art] It can rewrite and the magneto-optic-recording medium which consists of an alloy of a rare earth-transition-metals system (RE-TM system) is put in practical use as a high-density optical recording medium. However, points which should be improved, such as raising recording density, raising dependability, and attaining low cost-ization, are left behind to the magneto-optic-recording medium of this RE-TM system.

[0003] As a high density recording method of a magneto-optic-recording medium, the configuration of a record pit is made into a feathers-of-an-arrow-like thing from the thing of the shape of the conventional circle configuration or an ellipse, or there is the so-called point-of-a-brush recording method which makes a record section only the temperature rising section field of a very small area of an optical exposure part. It is not that (pit position method) which detects the location of a pit at the time of playback, and the thing which detect the edge of a pit and which is made like (pit edge method) is effective in high density record. Thus, the device improvement of high recording density is made in both record and playback.

[0004] Moreover, short-wavelength-izing of the record light source is also effective in a raise in recording density. Implementability is expected also for the light source of utilization of 700nm band and 600nm band, 500nm which combined semiconductor laser and a secondary harmonic generation component (SHG) further, or 400nm band from the semiconductor laser near the present 800nm.

[0005] If short wavelength-ization of the device of such a record playback approach and the light source etc. is combined, it is expected that recording density becomes one 10 times the number [several times -] of this compared with the present thing. However, the magneto-optic-recording medium of a RE-TM system has the small magneto-optics engine performance (θ_K ; car angle of rotation) from the first, and the more a record pit becomes small, the more a regenerative signal falls. Moreover, when the wavelength dependency of car angle-of-rotation θ_K is investigated, it decreases as it becomes short wavelength, and θ_K near 400-500nm is about 1 near 800nm of that / three to 2/3. therefore, the magneto-optics engine performance is larger than a RE-TM system, and the magneto-optics engine performance does not fall in a short wavelength region -- it is -- it is -- it looks for a record ingredient which increases.

[0006] Moreover, also in respect of dependability, in order that rare earth (RE) may tend to oxidize, in a medium configuration, especially the magneto-optic-recording medium of a RE-TM system needs to prepare a protective coat, and a degree of vacuum must be raised at the time of manufacture, an expensive manufacturing installation must be used for it, or it must pay special attention at it. Therefore, together with the fall of the yield from the difficulty of manufacture, it had become the factor of cost quantity.

[0007]

[Problem(s) to be Solved by the Invention] Then, the Pt/Co cascade screen and Pd/Co cascade screen which carried out the laminating of the thin layer of Pt or Pd and the thin layer of Co by turns attract attention.

[0008] Since Pt, and Pd and Co are excellent in corrosion resistance, they are reliable. Furthermore, the wavelength dependency of θ_K does not have reduction in a short wavelength region like a RE-TM system, it is a short wavelength region and it is [especially θ_K of a Pt/Co cascade screen is larger than a TE-TM system, and] suitable for record using the future source of short wave Nagamitsu. However, not the value of still sufficient θ_K but

improvement in further θ_K is desired.

[0009]

[Means for Solving the Problem] Then, the purpose of this invention is by devising a medium configuration to offer the rewritable magneto-optic-recording medium excellent in dependability or the magneto-optics engine performance, in order to improve the property of the crosswise lamination film of platinum group elements, such as Pt and Pd, and Co system element.

[0010] what is depended on the alloy formed in the interface of a cascade screen as the origin of the so-called perpendicular magnetic anisotropy where Pt/Co and a Pd/Co cascade screen turn into perpendicular magnetic anisotropy films or make to be based on the magnetostriction by the misfit of the crystal lattice in an interface etc. into any -- it is thought that it is based on the interface effectiveness.

[0011] Then, it resulted in this invention as a result of the research which ****(ed) improvement in θ_K , without spoiling the interface effectiveness of a cascade screen.

[0012] Namely, three layer membranes which carried out the laminating of the upper layer and the lower layer of a layer which consist of a transition-metals element in the layer which consists of platinum group elements are used as the 1st layer. The layer which makes Co a subject by using as record film the crosswise lamination film which used as the 2nd layer the layer which makes Co a subject, and carried out two or more laminatings of the 1st layer and 2nd layer by turns Since it becomes the configuration by which the laminating was carried out in contact with the layer which always consists of platinum group elements, such as Pt and/, or Pd, Between the layers which consist of platinum group elements, increase of desired θ_K was seen according to optical cross protection or a false plasma mesomeric effect by having prepared transition-metals layers, such as Au, Ag, and Cu, etc., without spoiling the interface effectiveness which carries out induction of the perpendicular magnetic anisotropy.

[0013] In order to fully acquire the above-mentioned effectiveness, since at least 1 atomic layer is required, in order for 8Å or more of thickness of the base unit of the 1st layer to be perpendicular magnetic anisotropy films further about at least one every atomic layer and a transition-metals element in platinum group elements, the thickness of the base unit of the 2nd layer which makes 30Å or less and Co a subject has 2Å or more need 10Å or less as the 1st layer. Moreover, all the thickness of the crosswise lamination film of the 1st layer and the 2nd layer has 50Å or more desirable 500Å or less from an optical reflection factor and the consideration on production. Furthermore, as a magneto-optic-recording medium, a substrate is transparent to the wavelength of the light source used [plastic resin / glass,], and the groove etc. may be formed.

[0014] Moreover, a substrate layer may be prepared between the record film of this invention, and a substrate. that a substrate layer controls the crystallinity of record film **** -- a film strain -- induction, the effectiveness which adjusts and controls H_c , or/-- and It has the effectiveness which carries out enhancing of the magneto-optical effect. Various metallic elements and the alloy of those, Moreover, the magneto-optics enhancing layer which consists of various dielectrics further after [which is the layer which consists of various dielectrics] carrying out the laminating of the record and/ Or the protective layer which consists of the reflecting layer which consists of various metallic elements or an alloy of those and/or various metallic elements with good corrosion resistance and the alloy of those and a compound, organic resin, etc. may be prepared.

[0015]

[Example]

[Example 1] In the RF sputtering system of 3 yuan, the target of Pt, Au, and Co of 125mmphi was installed, and spatter ** 6×10^{-3} Torr and a membrane formation rate were controlled by changing spatter power with 100-500W.

[0016] First, on the glass substrate, the laminating of the Pt was further carried out by Pt5Å by Au5Å at 5Å and a degree, and then Co was formed by 5Å. The cascade screen of about 160Å of the total thickness was repeatedly created 8 times in this sequence (Pt/Au/Pt/Co).

[0017] Next, as an example 1 of a comparison, an equivalent for Pt15Å and the crosswise lamination film (Pt/Co) of Co5Å were repeated 8 times on the glass substrate, and the cascade screen of about 160Å of the total thickness was created. An equivalent for Au15Å and about 160Å (Au/Co) of crosswise lamination film of Co5Å were similarly created as an example 2 of a comparison.

[0018] The wavelength dependency of θ_K of each above cascade screen and H_c (coercive force) were measured. Consequently, the cascade screen (Pt/Au/Pt/Co) and the cascade screen (Pt/Co) turned into perpendicular magnetic anisotropy films, and the 600Oe(s) (Au/Co) cascade screen of that H_c was field intima. As the wavelength dependency of (Pt/Au/Pt/Co) and θ_K of each (Pt/Co) cascade screen was shown in drawing 2 , in the cascade screen (Pt/Au/Pt/Co), increase of θ_K was seen in wavelength 500 - near 550nm.

[0019] Like the [examples 2 and 3] example 1, instead of Au target, each target of Ag and Cu was used and about every

5A per layer of the cascade screens (Pt/Ag/Pt/Co) of about 160A of the total thickness and (Pt/Cu/Pt/Co) cascade screens were created. Hc(s) were 550Oe(s) and 600Oe, respectively, and as shown in drawing 2, near 400-500nm and by the cascade screen (Pt/Cu/Pt/Co), the wavelength dependency of thetaK is near 600nm, and increased from the cascade screen (Pt/Co) of the example 1 of a comparison at the cascade screen (Pt/Ag/Pt/Co).

[0020] Like the [examples 4-6] examples 1-3, instead of Pt target, Pd target was used and about every 5A per layer of the cascade screens (Pd/Au/Pd/Co) of the about 160-180A of the total thickness, cascade screens (Pd/Ag/Pd/Co), and cascade screens (Pd/Cu/Pd/Co) were created. Next, the cascade screen (Pd/Co) of an equivalent for Pd15A and Co5A was formed about 170A of the total thickness as an example 3 of a comparison. Although Hc hardly changed (Pd/Au/Pd/Co), (Pd/Ag/Pd/Co), (Pd/Cu/Pd/Co), and each (Pd/Co) cascade screen but was 650-700Oe, 20 - 30% of increase was seen [in / compared with a cascade screen (Pd/Co) / in the cascade screen containing Au, Ag, and Cu each class / each peak wavelength] by the result of measurement of the wavelength dependency of thetaK like examples 1-3 and drawing 2.

[0021] Like the [examples 7-10] example 1, an equivalent for Co5A was received and Hc of the cascade screen (Pt/Au/Pt/Co) which changed and created various laminating thickness of (Pt/Au/Pt) was measured. A result is shown in Table 1. In addition, the thickness of each class of Pt:Au:Pt was set up so that it might be set to about 1:1:1.

[0022] Next, it sets each class of Pt/Au/Pt at a time about as 5A, and Hc of the cascade screen (Pt/Au/Pt/Co) which changed and created various Co thickness is also shown in Table 1. Consequently, in the thickness of (Pt/Au/Pt), the thickness of 8A or more 30A or less and Co layer became perpendicular magnetic anisotropy films at the time 2A or more of 10A or less.

[0023] Although this was different instead of Pt and the value of Hc was different as for Ag and Cu instead of Pd and Au, the range of thickness used as perpendicular magnetic anisotropy films was the same.

[0024]

[Table 1]

表 1

	(Pt/Au/Pt) 厚	Co厚	総膜厚	Hc
実施例7	～ 8 Å	～ 5 Å	～170 Å	500 Oe
“ 8	～25	～ 5	～150	300
比較例4	～32	～ 5	～150	(面内膜)
実施例9	～15	～ 2	～170	250
“ 10	～15	～10	～150	100

[0025]

[Effect of the Invention] By using as the 2nd layer the layer which uses as the 1st layer three layer membranes which carried out the laminating of the upper layer and the lower layer of a layer which consist of a transition-metals element in the layer which consists of platinum group elements, and makes Co a subject, and making it the crosswise lamination film of the 1st layer and the 2nd layer, as explained above The magneto-optic-recording medium whose thetaK improved can be offered according to the effectiveness by having prepared the transition-metals element layer, without spoiling the interface effectiveness which carries out induction of the perpendicular magnetic anisotropy of Co and platinum group elements.

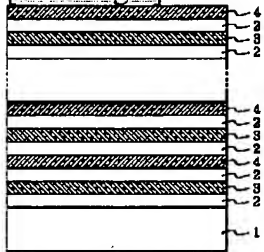
[0026] And it is better for the 1st layer of the above to be 8A or more 30A or less, and for the 2nd layer to be 2A or more 10A or less, in order that the magneto-optic-recording medium of this invention may pull out the property enough.

[Translation done.]

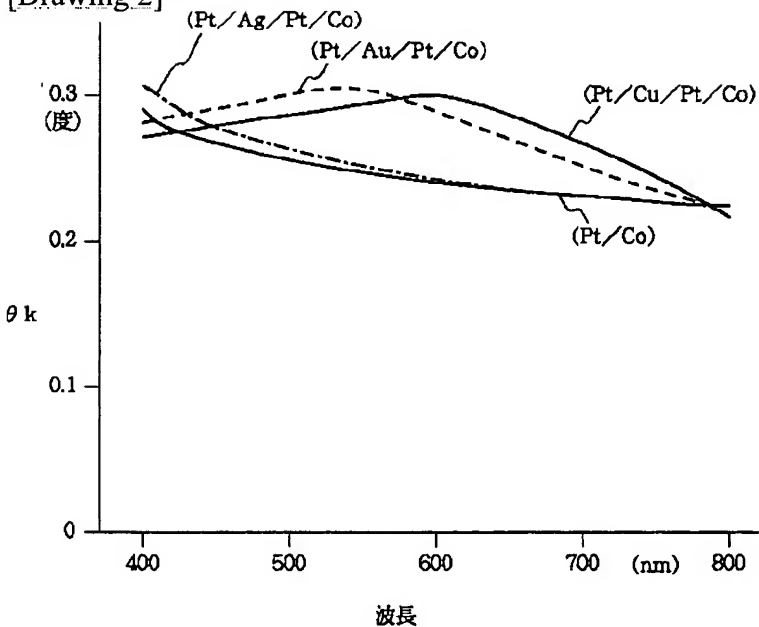
- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.**** shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

DRAWINGS

[Drawing 1]



[Drawing 2]



[Translation done.]